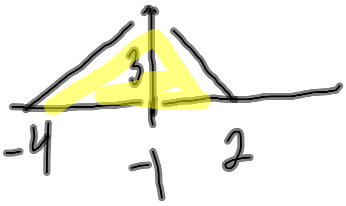
H.W.

15.




$$\bar{y} = \frac{1}{b-a}\boxed{\int_a^b f(x)\,dx}$$

area

$$= \frac{1}{2--4}\left(\frac{1}{2}\cdot 6\cdot 3\right)$$

$$= \frac{3}{2}$$

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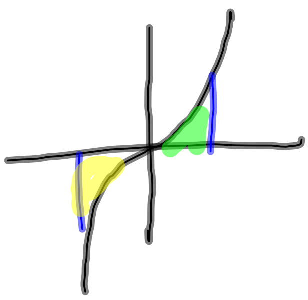
18. $\tan\theta$ $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$



$$\bar{y} = 0$$

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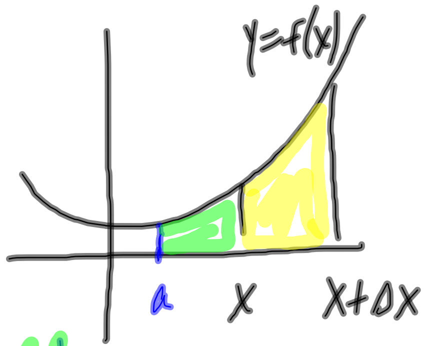
# 5.4 Proof of the F.T.C




$\Delta F$ = shaded area

$$\boxed{\lim_{\Delta x \to 0} \frac{\Delta F}{\Delta x}} = y = f(x)$$

F(x) is area from a to x

$$\Delta F = F(x+\Delta x) - F(x)$$

$$\boxed{\lim_{\Delta x \to 0} \frac{F(x+\Delta x) - F(x)}{\Delta x}} = f(x)$$

same $\rightarrow$ $F'(x) = f(x)$

$\rightarrow$ F(x) is an antiderivative of f(x)

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# FTC restated

$\frac{d}{dx} F(x) = f(x)$

$$\boxed{\frac{d}{dx} \int_a^x f(t)\, dt = f(x)}$$

version I

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

where F(x) is an antiderivative of f(x)

version II

$F'(x) = f(x)$

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$$\frac{d}{dx}\int_{-\pi}^{x}\cos(t)\,dt = \cos x$$

$$\frac{d}{dx}\int_{1}^{x}\frac{1}{1+t^2}\,dt = \frac{1}{1+x^2}$$

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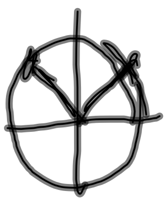
37. $$\int_{\frac{\pi}{4}}^{3\pi/4}\csc x\cot x\,dx = 0$$

$$-\csc x\Big|_{\pi/4}^{3\pi/4} = -\csc\frac{3\pi}{4} - -\csc\frac{\pi}{4}$$



$$\frac{-1}{\sin\frac{3\pi}{4}} + \frac{1}{\sin\frac{\pi}{4}} = \frac{-1}{\sqrt{2}/2} + \frac{1}{\sqrt{2}/2} = 0$$

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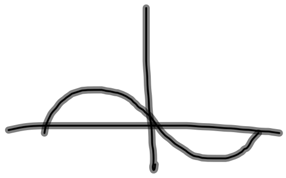
44. total area



$y=x^3-4x$ $[-2,2]$

$$\int_{-2}^{0} x^3-4x\,dx + \left|\int_{0}^{2} x^3-4x\,dx\right|$$

Nov 19-2:07 PM